



# Tuner's Topics

## Frequency Division Multiplexing

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In the last issue of TAC (Summer 1977, p. 16) I discussed time division multiplexing. This issue I will explain frequency division multiplexing (FDM), which is also a way of sending many different messages, simultaneously, over one pair of wires or one radio frequency without any message interference.

FDM multichannel systems transmit messages on separate carrier waves that are sine-wave frequencies. To send several messages by FDM, you just merge the output frequency of each message with a separate *carrier* frequency. This process of merging is called *modulation*.

Here's an example to explain the FDM process. A telephone transmits a voice frequency (VF) range of 300 to 3,500 Hz. To transmit on channel 1, you modulate the VF with a carrier frequency of, say, 8,000 Hz. The modulated frequency range that results is from 4,500 to 7,700 Hz. To transmit on channel 2, modulate the VF with a carrier frequency of 12,000 Hz for a modulated range of 8,500 to 11,700 Hz. On channel 3 modulate the VF with a carrier frequency of 16,000 Hz for a modulated frequency of 12,500 to 15,700 Hz.

The frequencies are far enough apart that the messages

won't interfere with each other when they're transmitted.

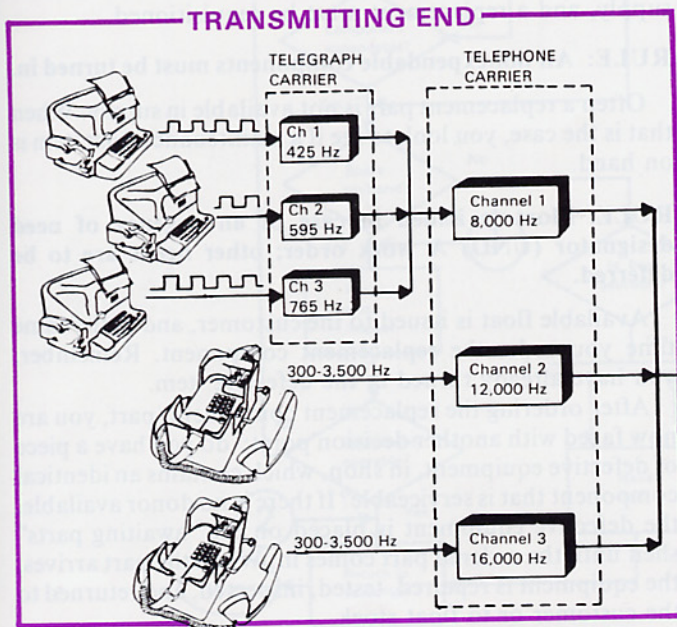
At the receiving end each channel is tuned to select only the correct modulated frequency band. Each channel also has a device that *demodulates* the modulated frequency back to the original voice frequency. **Messages sent!**

Both voice and teletype messages can go over the same transmitter. And because teletype signals can be converted by carriers into distinct frequencies within the VF range, you can transmit several teletype messages (up to 16) simultaneously over one telephone channel. It's easy to see from the illustration below that more teletypewriter messages can be sent at one time than telephone messages.

Frequency division multiplexing is more complex than I can explain in detail here. There are oscillators, modulators, bandpass filters, low pass filters, discriminators, and all the wire or radio transmission gear. And there are some complicated electronic principles to deal with. But putting it all into a "lean and mean" communications package is our job, right?

*Tuner*

### TRANSMITTING END



### RECEIVING END

